

DESCRIPTION OF THE JUVENILE FORM OF THE
ANTARCTIC SQUID *MESONYCHOTEUTHIS HAMILTONI* ROBSON¹

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ABSTRACT

The juvenile form of *Mesonychoteuthis hamiltoni* Robson is fully described and figured from 4 specimens captured by the U.S. Naval Ship ELTANIN in Antarctic waters. Measurements and indices are given. This constitutes the first full description of the species. The validity of the genus is reaffirmed, but relationships to other genera within the family Cranchiidae are not yet clear.

In 1925 Robson described a new species of squid, *Mesonychoteuthis hamiltoni*, from 2 large brachial crowns taken from the stomach of a sperm whale captured near the South Shetland Islands. He was uncertain of the systematic position of the species represented by these fragments, but tentatively placed it between the Onychoteuthidae and Enoploteuthidae (Robson, 1925: 272). The principal features mentioned by Robson in this paper were the presence of hooks in the central portion of the arms, and the supposedly distinctive structure of the tentacular hooks. Clarke (1966) includes the species in his systematic review, with the statement "*M. hamiltoni* is a taonine cranchiid which attains giant size" (Clarke, 1966: 240). Clarke further states that the genus *Mesonychoteuthis* is monotypic and is "characterized by hooded hooks in the middle of each arm." The only other reference to the genus found in the literature is Clarke's (1962) discussion of the mandibles.

Among the Antarctic cephalopod collections made by the National Science Foundation's research ship ELTANIN

are 4 small cranchiid squids which bear hooded hooks in the central portion of the arms, and must be referred to Robson's species. The following description of these juvenile specimens constitutes the first full description of the species.

The writer would like to thank Dr. G. L. Voss of the Institute of Marine Sciences for his comments and criticisms of the manuscript. Dr. R. E. Young of the Department of Oceanography, University of Hawaii, materially aided the writer by offering many helpful suggestions and critically read the manuscript. The specimens on which the description is based were collected by the University of Southern California's biological sampling program aboard the U.S.N.S. ELTANIN. The terminology used in describing the mandibles is after Clarke (1962) and Mangold & Fioroni (1966). The illustrations were executed by my wife Constance.

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Mesonychoteuthis hamiltoni Robson, 1925

Figs. 1-3

Mesonychoteuthis hamiltoni Robson, 1925, p. 272, figs. 1, 2.

Material examined:

- 1 Specimen, mantle length 86 mm. ELTANIN Sta. 142. 60°04'S, 65°15'W. 10 Aug. 1962. 3 m IKMT, 0-1850 m.
- 1 Specimen, mantle length 68 mm. ELTANIN Sta. 929. 70°12'S, 110 17'W. 19 Jan. 1964. 3 m IKMT, 0-1098 m.
- 1 Specimen, mantle length 59 mm. ELTANIN Sta. 941. 69°56'S, 98°31'W. 23 Jan. 1964. 3 m IKMT, 0-2562 m.
- 1 Specimen, mantle length 59 mm. ELTANIN Sta. 946. 67°39'S, 90°27'W. 26 Jan. 1964. 3 m IKMT, 0-1711 m.

Description

The mantle is short and wide (MWI=35.0), tapering smoothly to the middle of the fins, where it abruptly narrows to closely sheath the gladius. Only the integument continues over the conus. The mantle is thin and leathery, and is fused to the head at the dorsal midline and ventrally to each side of the funnel. At each ventral fusion there is a 5 or 6-pointed cartilaginous tubercle, and at the dorsal fusion point there is a single small, conical tubercle. The gladius is distinctly visible through the integument along the dorsal midline. The fins measure 20-30% of the mantle length and are almost semi-circular (FLI, FWI=21.0). The funnel is broad at the base and tapers rapidly, extending nearly to the base of the ventral arms. It is fused to the head dorsally. The dorsal member of the funnel organ has the shape of a rounded, inverted V, with the two legs of the V directed slightly outward at the tips. At the apex there

is a long conical tubercle surmounted by a narrow flap of tissue. The height of this tubercle is $\frac{1}{3}$ to $\frac{1}{2}$ the total length of the dorsal member. At the posterior end of each leg of the V, there is a smaller, rounded tubercle. The ventral pads are fanshaped, with the apex directed anteromedially. There is no trace of a funnel valve.

The head is small, with large globular eyes. The total width, including the eyes, is less than the mantle width (HWI=25.0). The eyes are directed outward at an angle of about 45° from the longitudinal axis. The eyes have a large, wide, crescent-shaped light organ applied to the ventral surface, and extending upward almost half the circumference. A smaller, oblong light organ lies inside the concavity of the crescent, close to the pupil. There is a very small anterior notch in the rim of the eye opening. The stalk of the "olfactory papilla" is very short, and the organ is closely applied to the posterior surface of the eye capsule, well below the midline.

The arms range from 20-30% of the mantle length in smaller specimens and from 30-40% in the larger specimens. They are round in cross section, with the formula 4.3.2.1. Protective membranes and trabeculae are fairly well developed on the ventral side of all the arms, and consist of a low, scalloped fringe on the dorsal side. A weak swimming keel is present on the third arms, and a stronger lateral keel on the ventral arms. The suckers are arranged in 2 rows with small suckers proximally, becoming larger to about the mid-point of the arms, where they are replaced by prominent hooks. On the largest specimen, these hooks are initially much larger than any of the suckers, becoming the same size distally. On the smaller specimens, the proximal hooks are about equal in size to the preceding suckers. The distal portion of the arms again bears suckers, the most proximal of these being slightly smaller than

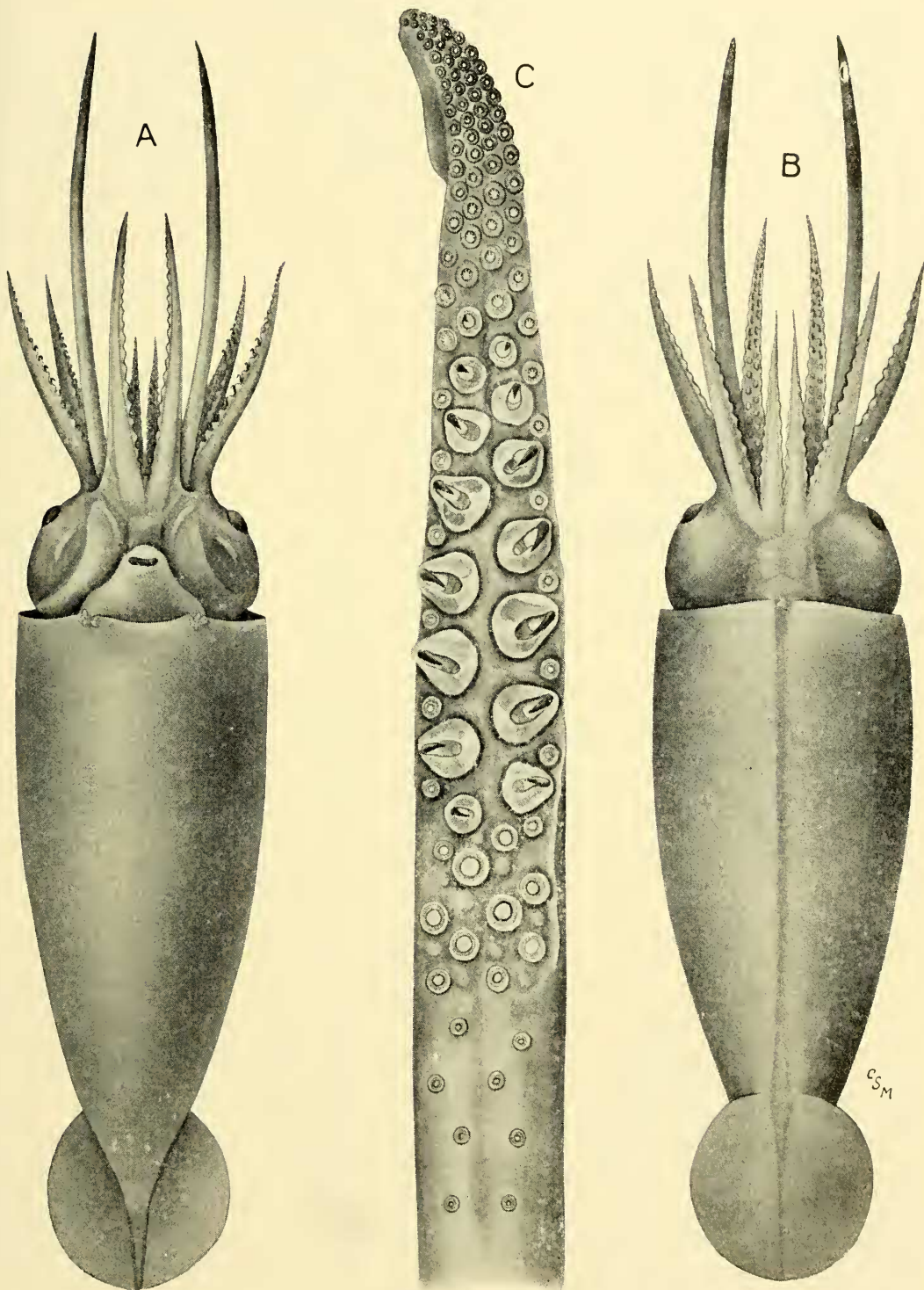


FIG. 1. *Mesonychoteuthis hamiltoni* Robson. Mantle length 86 mm (ELTANIN Sta. 142). A. Ventral view. B. Dorsal view. C. Tentacular club.

TABLE 1. Measurements (in mm) of 4 juvenile specimens of *Mesonychoteuthis hamiltoni* Robson.

Character	ELTANIN Sta. 142	ELTANIN Sta. 929	ELTANIN Sta. 941	ELTANIN Sta. 946
Mantle length	86	68	59	59
Head width	27	17	15	15
Eye diameter	15	10	8	8
Fin length	22	14	11	11
Fin width	21	14	11	11
Arm length: I	25	13	11	10
II	29	18	13	11
III	31	20	16	14
IV	33	24	18	16
Tentacle length	60	44	46	37
Club length	15	12	10	9

the last sucker proximal to the hooks. Table 3 lists the numbers of proximal suckers and hooks. The number of suckers distal to the hooks ranges from 8-10 in the smaller specimens to 25-30 in the largest specimen. Dentition is apparent on the first few suckers distal to the hooks. This consists of incisions in the most distal quarter of the inner ring to form 1 to 5 irregular teeth.

The tentacles are moderately long and slender, oval in cross section and slightly flattened on the oral surface. The diameter is nearly constant, with the club tapering evenly to the tip. The only demarcation between the stalk and club is a slight constriction across the aboral surface. The club comprises one-quarter of the total tentacle length and is bordered by a very low and indistinct protective membrane on either side. There is a very small dorsal keel at the extreme

tip. The club bears 4 longitudinal rows of suckers, with from 22 (dorsal row) to 24 (ventral row) suckers. The first 6 to 8 suckers in the two central rows are modified into hooks. The suckers of these rows, distal to the hooks, decrease in diameter toward the tip, while those of the marginal rows are small suckers of nearly constant diameter throughout. The club suckers are armed with small teeth around the inner circumference, with those in the distal quarter better developed. The carpal apparatus consists of 10 suckers, without teeth, and 10 pads on each tentacle. The stalk carries 22 to 23 pairs of small suckers, alternating with pads, and extending almost to the base of the tentacle.

The buccal membrane has 7 lappets. The connectives attach dorsally to arms I and II, and ventrally to arms III and IV.

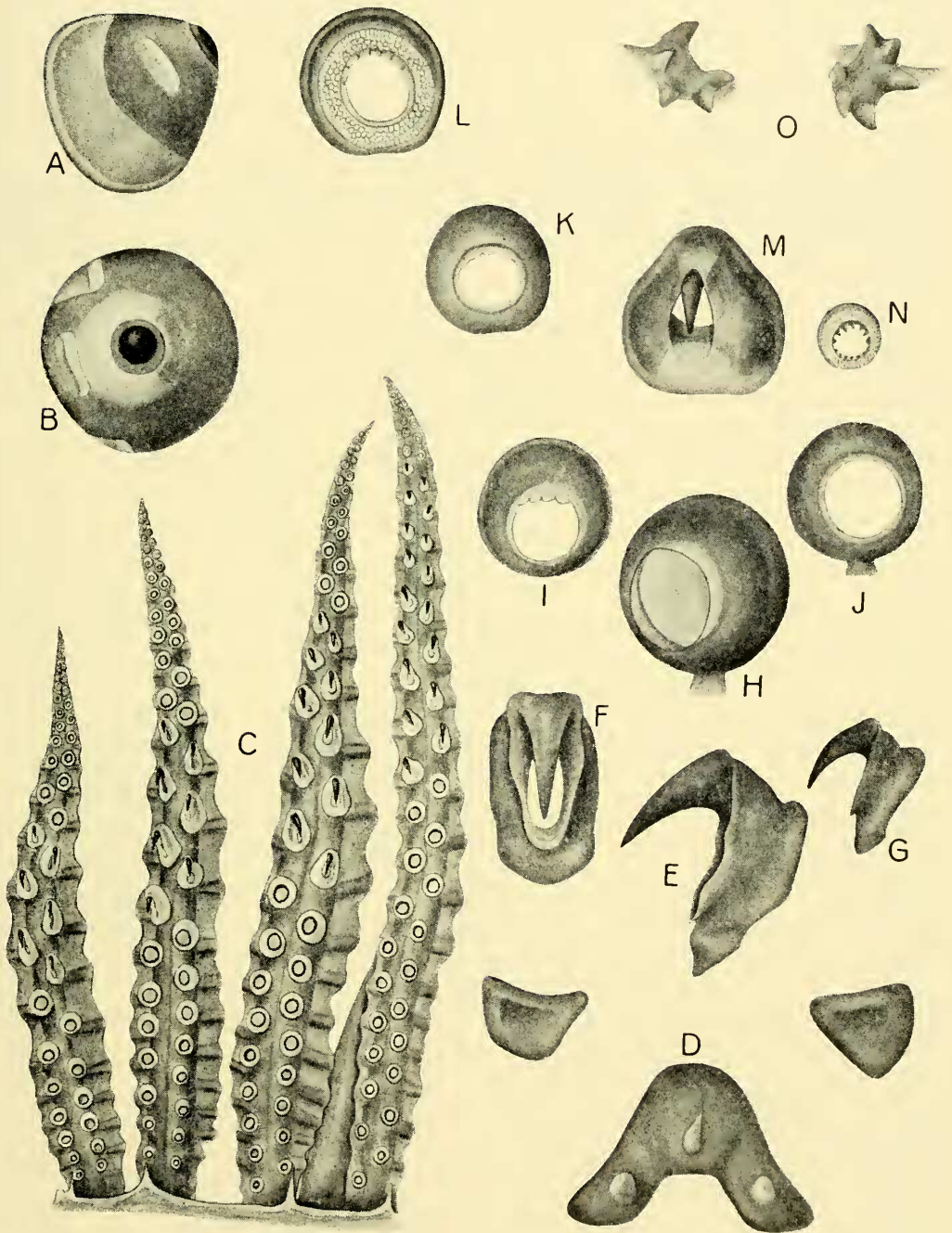


FIG. 2. *Mesonychoteuthis hamiltoni* Robson. (A-K, M-O, ELTANIN Sta. 142. L, ELTANIN Sta. 929). A. Vertral, and B. Lateral view of eye capsule, showing light organs. C. Left arms I-IV. D. Funnel organ. E, F. Hook, arm III. G. Hook, arm IV. H. 1st sucker proximal to hooks, arm III. I. 1st sucker distal to hooks, arm III. J. 1st sucker proximal to hooks, arm IV. K. 2nd sucker distal to hooks, arm II. L. 2nd sucker distal to hooks, arm I. M. Tentacular hook. N. Dactylus sucker. O. Cartilaginous tubercles at mantle-funnel fusion points.

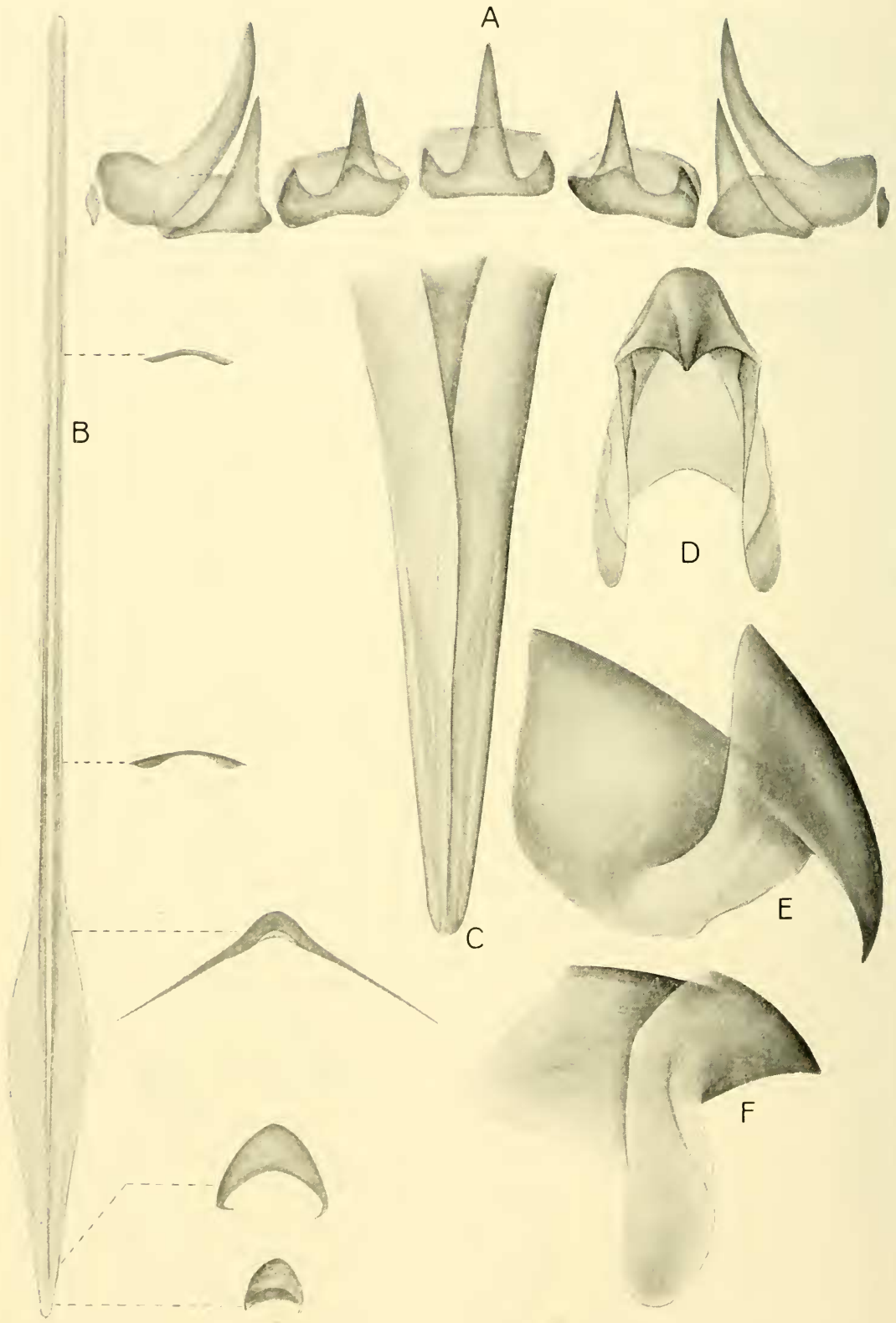


TABLE 2. Indices of bodily proportions of 4 juvenile specimens of *Mesonychoteuthis hamiltoni* Robson. All indices are the indicated measurement expressed as a percentage of the mantle length.

Character	ELTANIN Sta. 142	ELTANIN Sta. 929	ELTANIN Sta. 941	ELTANIN Sta. 946
Mantle width index (MWI)	35.0	31.0	34.0	36.0
Head width index (HWI)	31.0	25.0	25.0	25.0
Fin length index (FLI)	26.0	21.0	19.0	19.0
Fin width index (FWI)	26.0	21.0	19.0	20.0
Arm length index (ALI): I	29.0	19.0	19.0	17.0
II	34.0	26.0	24.0	20.0
III	36.0	29.0	30.0	26.0
IV	38.0	35.0	32.0	27.0
Club length index (CLI)	17.0	18.0	17.0	17.0

The hood of the upper mandible is slightly flattened dorsally and forms rounded angles dorso-laterally. These dorso-lateral angles join near the tip of the rostrum to form a dorsal ridge. The line of the inner edge of the rostrum continues posteriorly across the wing as a distinct ridge. Above this ridge, the lateral surfaces of the hood are slightly concave. The wings extend downward to the lower angle of the lateral wall. There is a wide area of fusion between the lateral wall and the wing, forming a slightly projecting shoulder. The jaw angle is about 90°, and is somewhat recessed. The hood length is approximately $\frac{3}{4}$ of the crest length.

The lower mandible has the obtuse jaw angle partially obscured by an overlapping lateral bulge of the wing. The wing ex-

tends downward beyond the lower margin of the lateral wall. The hood length is slightly more than $\frac{1}{2}$ the crest length.

The radula has a tricuspid rachidian tooth with a long median and small outer cusps. The first lateral tooth has a broad base, with a moderately long inner cusp and a small outer cusp. The second lateral is simple, broad and thick at the base, and somewhat longer than the first lateral. The third lateral is simple, strongly curved, and longer than the other teeth. The marginals are very small, unarmed plates.

The gladius is narrow, with the vanes bordering the posterior third of the rachis. The anterior $\frac{2}{3}$ of the rachis is very narrow, of nearly uniform width, and slightly concave ventrally. In the region of the vanes, it is thickened and

FIG. 3. *Mesonychoteuthis hamiltoni* Robson (A, B, D, E, F, ELTANIN Sta. 142; C, ELTANIN Sta. 946). A, Radula. B, Gladius. C, Conus of gladius; ventral view D, E, Upper mandible. F, Lower mandible.

TABLE 3. Numbers of proximal suckers and hooks on arms of juvenile specimens of *Mesonychoteuthis hamiltoni*. Question marks indicate missing hooks at end of series.

Character	ARM	ELTANIN Sta. 142	ELTANIN Sta. 929	ELTANIN Sta. 941	ELTANIN Sta. 946
Proximal	I	13/14	13/13	14/15	14/14
Suckers (Right/Left)	II	15/14	13/13	15/15	15/15
	III	17/17	16/16	19/19	18/18
	IV	20/20	19/20	22/22	22/21
	I	6/6	6/5	7/7	5/5
Hooks (Right/Left)	II	7/8	8/7	8?/9?	6/6
	III	10/9	9/9	10/10	7/8
	IV	16/16	13/14	10+/12?	8/7

steeply ridged along the midline. At the posterior tip the vanes overlap ventrally, but are not fused. This portion of the gladius of a 59 mm specimen (ELT 946) is illustrated in Fig. 3C. All others had the vanes broken away in this region.

DISCUSSION

It is difficult to compare the present material with Robson's original description, even without considering the disparity in size. Some of the features which he mentioned as being characteristic were most probably the result of the action of the digestive process. However, some conclusions can be drawn.

The arms present the feature of greatest interest, namely the series of hooks in the central portion. As *Mesonychoteuthis* is the only cranchiid known to possess hooks on the arms, it is not surprising that this armament, coupled with the tentacular hooks, led Robson to ally the species with the enoploteuthids and

onychoteuthids. The presence of the hooks in these juvenile specimens is of utmost importance, as it accentuates the value of this feature as a generic character. This character makes *Mesonychoteuthis* easily separable from *Galiteuthis*, which it resembles in the possession of tentacular hooks. The writer has examined a mature specimen of *Galiteuthis* and found well developed suckers present along the full length of the arms.

In Robson's specimens, the suckers were missing in the distal portion of the arms, with the stumps remaining. He considered that this was the result of atrophy rather than accident (Robson, 1925: 273). The fact that in the present material the suckers extend to the tips of the arms indicates that in Robson's specimens these suckers were probably lost accidentally or through digestion.

Robson considered the "swivel-movement" of the tentacular hooks to be a feature characteristic of only a few species (1925: 275). After an examination of

specimens of most of the genera which have tentacular hooks, it is apparent that all are capable of some degree of swivel-motion, probably much more so in life than is indicated in preserved animals. The principal difference between species seems to be in the degree of freedom of movement, although differences are not really great. It is doubtful that this feature has particular significance in *Mesonychoteuthis*. The tentacular club of Robson's specimen was probably broken, as he mentions a "very short hand" and states that it lacked suckers (1925: 275). It is possible that the proportions of the club change with growth, but it seems probable that the extreme condition reported by Robson was the result of damage or digestion, or both. The lack of differentiation between the tentacular stalk and the comparatively long club is a distinctive feature of the specimens described above.

Robson described the row of suckers and pads on the tentacular stalk as being "unique among these forms" (1925: 276). What is meant by "these forms" is unclear, but this conformation is common among cranchiid squids, while it does not occur in either of the families to which he supposed *Mesonychoteuthis* was most closely related.

The eyes are completely sessile in the present material, giving no indication of a stalked condition, although it is very likely that younger forms pass through such a stage. This has been shown to be the case in *Desmoteuthis* (= *Megalocranchia*) by Muus (1956), and has been observed by the writer in specimens of *Taonius* and *Galiteuthis*. No features observed in the present material could be considered larval characters.

The light organs of the eye, although well-formed in the largest specimen, are probably not completely developed. In the smaller specimens, the small light organ at the inside of the ventral crescentic

organ is only partially formed, consisting of a narrow, thickened ridge. In the larger specimens, this ridge is bordered by an area of thin, dark tissue. These organs may in time become crescent-shaped also, or oval.

The mandibles show some differences from Clarke's (1962) description of a much larger example. The significance of these differences cannot be determined without a series bridging the gap in size. The principal differences are in the concave lateral surfaces of the hood, and the ridge across the midpoint of the wing.

The radula shows a considerable difference from Robson's illustration (1925, fig. 1), but the differences can probably be explained by both the difference in size of the specimens and the angle at which the drawings were made. In Robson's figure, the third lateral tooth is shown as nearly straight, although Robson states (1925: 276) that it is slightly curved. This indicates that the drawing was made without flattening the ribbon, which could account for other differences, as in the relative height of the cusps. Robson also overlooked the marginal plates, which are extremely small.

These specimens show similarities to other genera in some respects, notably to *Megalocranchia* in general appearance, and to *Galiteuthis* in possession of tentacular hooks. However, this resemblance is only superficial, as is shown by most of the principal characters. It would be premature at this time to speculate on relationships within the family.

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RÉSUMÉ

DESCRIPTION DE LA FORME JUVÉNILE DU CALMAR ANTARCTIQUE *MESONYCHOTEUTHIS HAMILTONI* ROBSON

E. S. McSweeney

La forme juvénile de *Mesonychoteuthis hamiltoni* Robson est entièrement décrite et figurée à partir de quatre spécimens capturés par le U.S.N.S. Eltanin dans les mers antarctiques. Des mensurations et des indices sont donnés. Cela constitue la première description complète de l'espèce. La validité du genre est réaffirmée, mais la relation avec les autres genres de la famille des Cranchiidae n'est pas encore claire.

A. L.

RESUMEN

DESCRIPCION DE LA FORMA JUVENIL DEL CALAMAR ANTARTICO *MESONYCHOTEUTHIS HAMILTONI* ROBSON

E. S. McSweeney

La forma juvenil de *Mesonychoteuthis hamiltoni* Robson, se describe en forma completa y se ilustra con 4 ejemplares que fueron capturados por el U.S.N.S. ELTANIN en aguas antarticas. Todo esto constituye la primera descripción total de la especie. Se confirma la validez del género *Mesonychoteuthis*, aunque su relación con otros en la familia Cranchiidae no resulta todavía muy clara.

J. J. P.

АБСТРАКТ

ОПИСАНИЕ ЮВЕНИЛЬНОЙ ФОРМЫ АНТАРКТИЧЕСКОГО КАЛЬМАРА *MESONYCHOTEUTHIS HAMILTONI* ROBSON

Э. С. МЭКСВИНИ

Ювенильные формы *Mesonychoteuthis hamiltoni* Robson описаны и изображены по 4 экземплярам, пойманным на корабле "Илтенин" в водах Антарктики. Приводятся данные измерений и индексы, что дополняет первое полное описание этого вида. Подтверждается валидность рода, однако его взаимоотношения внутри семейства Cranchiidae еще не ясны.

Z. A. F.